and Segerberg, S., "Helium Recovery and Cleaning for High Pressure Gas Quenching Connected to an Atmosphere Furnace," The Third International Conference on Quenching and Distortion Control, March 1999. A copy of the reference is enclosed with the Supplemental Information Disclosure Statement.

Claims Amendments

Applicants have cancelled Claims 8-16 as non-elected claims.

Claim 1 has been amended to specify that the treating gas and quenching gas are separated by a membrane filter. Support for this amendment to Claim 1 can be found in the specification at, for example: item 30 of Figure 3 and page 9, lines 17-29.

Claim 1 has also been amended to delete steps "E" and "F." Support for this amendment can be found in the specification at, for example, page 12, lines 5-15.

No new matter has been added.

Examiner's Comments with Respect to Information Disclosure Statement

In the Office Action, Made Final, the Examiner commented that Applicants' remarks about the Information Disclosure Statement filed on April 3, 2000 failed to comply with 37 C.F.R. §1.98(a)(1), which requires a list of all patents, publications, or other information submitted for consideration by the office.

In response, Applicants herewith submit a Supplemental Information Disclosure Statement listing the reference for which no date was provided on the Information Disclosure Citation filed on February 28, 2001. Applicants believe that submission of this reference as part of the attached Supplemental Information Disclosure Statement meets the requirements of 37 C.F.R. §1.98.

Rejection of Claim Under 35 U.S.C. §103

Claims 1-7 are rejected Under 35 U.S.C. §103 as being unpatentable over U.S. 5,938,866, issued August 17, 1999 to Andersson, *et al.*, (hereinafter Andersson, *et al.*). The Examiner stated that Andersson *et al.* disclose hardening a metal article with nitrogen gas, transporting a hardened metal article to a cooling chamber, cooling the hardened the metal article with pressurized helium gas, and transporting the cooled metal article out of a cooling chamber. The Examiner further stated that, although Andersson, *et al.* do not disclose a heating temperature, as referenced in Applicants' dependent Claim 4, it would be within skill of the ordinary artisan to select known

heat treatment temperatures for known metal materials, and that it has been held that an invention within the realm of performance of the skilled artisan is not patentable subject matter.

Andersson, *et al.* disclose a method for heat treating a metal component and an endothermic gas, such as nitrogen gas, followed by cooling the heat-treated component with another gas, such as helium. The gas to which the metal component is exposed during heat treatment is referenced in the specification as a "first gas," while the gas that is employed to quench, or cool the metal component is referred to as the "second gas." The object of the method taught by Andersson, *et al.* is to improve separation of the first and second gases. For example, as stated at column 1, line 65-67:

> The object of the present invention is to improve, when performing a treatment with gas, the possibilities to separate and recirculate the gases involved in the treatment.

The method by which the object is obtained includes maintaining an essentially complete separation between the first and second gases. For example, as stated at column 2, lines 1-20:

> Said object is attained by the initially mentioned method characterized in that said discharge comprises moving the gas mixture upwardly and out through an outlet member provided in an upper part of the treatment chamber by introducing additional gas, being heavier than the first gas, from below in the treatment chamber. Thereby, in the first place the lighter first gas will leave the treatment chamber and a first separation of two gases is achieved. Advantageously, the additional gases constituted of the second gas. Since the second gas is heavier than the first gas, it will not reach the outlet member but instead force the first gas upwards towards and out through this member. According to an embodiment, the additional second gas is introduced through a bottom surface of the treatment chamber as laminar inward flow into the treatment chamber. <u>In this manner, it is effectively guaranteed that the first gas and the second gas introduced from below are not being mixed with each other.</u> Advantageously, the laminar inward flow enters at essentially the total bottom surface of the treatment chamber. (Emphasis added).

In addition, the heat-treating gas is kept separate from the cooling gas by removing the heat-treating gas by vacuum and then purging the chamber containing the metal article with an additional gas, such as nitrogen, before employing a cooling gas, such as helium. As stated at Col. 4, line 57 through Col. 5, line 8:

> The process for hardening and gas recovery will now be described more closely. Metal articles heated in the hardening furnace 7 are transported into the closed chamber 8 being subjected to a vacuum by means of the vacuum tank 50 via the conduit 55 by the opening of the valve 58. Thereby, gases possibly being harmful for the following cooling process will disappear. After refilling of the closed chamber 8 with nitrogen by the opening of the valves 12a, 12b, the metal articles are transported to the transport chamber 9 where the transport device 11 moves the articles to the cooling chamber 10 for gas cooling. When the metal articles have been transported into the cooling chamber 10 the closing device (not shown) between the cooling chamber 10 and the transport chamber 9 is closed, and thereafter the valve 60 opens to provide a vacuum in the cooling chamber 10 by means of the vacuum tank 50. This is done to evacuate as much as possible of the nitrogen and thus to minimize the level of contamination of the nitrogen in the cooling process and thus the necessary size of the purification columns 29, 30. Then, the valve 60 is closed and the valve 38 opens to fill the cooling chamber 10 with the helium from the pressure tank 36 and pressurize the chamber 10 to approximately 15 bar. (Emphasis added.)

A small amount of contamination of helium with nitrogen occurs. For example, as stated at column 5, lines 18-29:

> When the cooling process is finished the fan is slowed down, the valves 21, 24 open and the cooling chamber 10 is evacuated by the pressure equalisation between the cooling chamber 10 and the buffer tank 23. Thereby, in the first place, the helium will leave the cooling chamber 10 since the cooling chamber 10, before the helium was supplied, was emptied of a large part of the nitrogen and since helium is lighter than nitrogen. However, a certain rest amount of nitrogen will be discharged to the buffer tank 23, since the evacuation occurs relatively rapidly and there is not enough time for any real separation of the two gases due to the weight difference.

Also, as stated at column 5, lines 33-40:

> When the pressure in the cooling chamber 10 has decreased to approximately 1-2 bar the valve 14a opens, while the compressor continues to suck gas from the cooling chamber 10, which slowly is filled from below with approximately 2 m^3 of nitrogen through the sintered mat 15. Thereby, the nitrogen moves the helium upwardly and out of the cooling chamber 10 through the outlet member 19 and then only neglectable rest amounts of helium remain.

Gas used during the cooling function is then purified by use of purification columns 29 and 30. Both columns employ a zeolite that binds with nitrogen, thereby allowing helium gas to pass through the zeolite as purified second gas. As stated at column 5, lines 55- column 6, line 1:

> The purification process for the gas used during the cooling functions according to the following. ...Thus, the gas mixture will be supplied from below through the purification column 29, the nitrogen present in the gas mixture being adsorbed by the zeolite in the purification column 29, whereas the lighter helium passes through the purification column 29 and the zeolite, and is transported further via valve 33 and the conduit 35 to the pressure tank 36.

Therefore, Andersson, *et al.* disclose a method of quenching a heat-treated component that partitions the heat-treating gas from the second, quenching gas. Further, Andersson, *et al.* teach that the second, quenching gas is purified by directing the gas through a zeolite purification column.

There is no disclosure or suggestion in Andersson, *et al.* of feeding a heat-treated component containing the heat-treating gas into a quenching chamber and feeding a quenching gas into the quenching chamber to contact the treated component and mix with the heat-treating gas, as set forth in Applicants' claimed method of heat-treating components in an atmospheric heat-treating furnace. Further, there is no disclosure or suggestion in Andersson, *et al.* of feeding the quenching gas and heat-treating gas into a gas recovery chamber where the heat-treating gas and the quenching gas are separated by a membrane filter to provide a purified quenching gas, as is also set forth in Applicants' claimed method as amended. Therefore, there is no disclosure or suggestion of Applicants' claimed method in Andersson, *et al.* Claims 2-6 depend directly or indirectly from independent Claim 1. Therefore, the subject matter of these claims also is not disclosed or suggested by Andersson, *et al.*

Applicants' claimed method for heat-treating components in an atmospheric heat treating furnace is not disclosed or suggested in Andersson, *et al.* Therefore, Applicants' claimed method meets the requirements of 35 U.S.C. §103(a).

SUMMARY AND CONCLUSIONS

Applicants have enclosed a Supplemental Information Disclosure Statement that remedies a deficiency associated with the Information Disclosure Statement filed on February 28, 2001. Further, as amended, Applicants' pending claims meet the requirements of 35 U.S.C.

§103(a) in view of Andersson, *et al.* Therefore Applicants respectfully request reconsideration and allowance of the pending claims of this application.

If the Examiner believes that a telephone conference would expedite prosecution, he is invited to call the undersigned Attorney.

Respectfully submitted,

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MARKED UP VERSION OF AMENDMENTS

Claim Amendments Under 37 C.F.R. § 1.121(c)(1)(ii)

1. (Amended) A process for heat treating components in an atmospheric heat treating furnace comprising the steps:

(a) treating a component in an atmospheric furnace with a treating gas;

(b) feeding the heat treated component containing the treating gas into a quenching chamber;

(c) feeding a quenching gas into the quenching chamber to contact the treated component and mix with the treating gas; and

(d) feeding the quenching gas and treating gas of step (c) into a gas recovery chamber where the treating gas and quenching gas are separated by a membrane to provide a purified quenching gas[;

(e) feeding the purified quenching gas of step (d) back into the quenching chamber; and

(f) removing the cooled treated component from the gas quenching chamber].